IN THE CLAIMS

The following claim listing replaces all prior listings and versions thereof:

1. (Original) A supporting structure for a lens barrel, the structure comprising:

an annular ring having an axis and a circumferential engagement surface provided circumferentially around said axis;

a first ring having an engagement surface circumferentially around said axis, and configured to contact said annular ring engagement surface and further configured to be mounted radially inwardly of said annular ring for rotational movement about said axis relative to the annular ring;

a second ring supporting at least one optical element, the second ring having an engagement surface provided circumferentially around said axis, and configured to contact the annular ring engagement surface and further configured to be mounted radially inwardly of said annular ring for rotational movement about said axis relative to the annular ring, the second ring being capable only of axial movement relative to the first ring; and

a biasing arrangement configured to urge the first and second rings in generally opposite directions and bias the first and second ring engagement surfaces into contact with the annular ring engagement surface.

2.(Original) The supporting structure according to claim 1, wherein the annular ring engagement surface comprises one or more circumferential grooves located on an inner peripheral surface of said annular ring, and wherein the first and second ring engagement surfaces are pressed against the respective opposed surfaces of said one or more circumferential

grooves.

3. (Original) The supporting structure according to claim 1, wherein the biasing arrangement comprises at least one spring provided between the first and second rings.

4. (Original) The supporting structure according to claim 1, wherein said biasing arrangement comprises at least one compression coil spring positioned between two opposed end surfaces of said first and second rings.

5. (Original) The supporting structure according to claim 1, wherein the circumferential extent of the engaging surface of the second ring lies within the circumferential extent of the engaging surface of the first ring.

6. (Original) The supporting structure according to claim 1, wherein the engaging surface of the first ring comprises two or more radially extending projections formed at different circumferential positions.

7. (Original) The supporting structure according to claim 6, wherein the first ring has three radially extending projections spaced substantially uniformly around the circumference thereof.

8. (Original) The supporting structure according to claim 2, wherein the radially extending projections each have an axially extending recess configured to receive the engagement surface of the second ring.

9.(Original) The supporting structure according to claim 1, wherein the annular ring includes an additional engaging surface extending in the axial direction and configured to communicate with the circumferential engaging surface of the annular ring; and

wherein the first and second rings are movable together to a position where the engaging surface of the first ring contacts the additional engaging surface, the engaging surface of the second ring not contacting the additional engaging surface in said position.

10. (Original) The supporting structure according to claim 9, wherein the additional engaging surface is configured such that rotation of the first ring results in movement thereof along said axis, relative to said annular ring, between front and rear limits.

11. (Original) The supporting structure according to claim 10, wherein said first ring includes a male helicoid positioned on an outer peripheral surface thereof, and wherein said annular ring includes a female helicoid positioned on an inner peripheral surface thereof and configured to be engageable with said male helicoid, said female helicoid and said male helicoid engaged with and disengaged from each other in accordance with variations in their relative position along said axis.

12. (Original) The supporting structure according to claim 11, wherein said inner peripheral surface of said annular ring includes at least one non-threaded portion located at an area in which and said female helicoid is located; and

wherein said non-threaded portion extends parallel to the threads of said female helicoid and communicates with said circumferential engagement surface of the annular ring; and

wherein said engagement surface of the first ring is configured to be associated with said at least one non-threaded portion when said male helicoid and said female helicoid are engaged with each other.

13. (Original) The supporting structure according to claim 12, wherein an amount of

projection of said engagement surface of the first ring in a radially outward direction is greater than a tooth depth of said male helicoid; and

wherein said non-threaded portion comprises at least one inclined groove extending generally parallel to said threads of said female helicoid; and

wherein said engagement surface of the first ring enters said inclined groove when said male helicoid and said female helicoid are engaged with each other.

14. (Original) The supporting structure according to claim 1, further comprising:

a linearly movable ring positioned radially inwardly of said first ring and configured to be guided linearly along said optical axis and move together with said first ring along said optical axis; and

a coupling mechanism configured to couple said first and second rings to said linearly movable ring, such that said first and second rings are rotatable relative to said linearly movable ring and are movable together with said linearly movable ring along said optical axis, said coupling mechanism configured such that each of said first and second rings are allowed by said coupling mechanism to move slightly in said optical axis direction with respect to said linearly movable ring.

15. (Original) The rotatable-ring supporting structure according to claim 1, wherein said lens barrel is incorporated in a camera.

16. (Original) The rotatable-ring supporting structure according to the claim 15, wherein said annular ring comprises a stationary barrel fixed to a camera body of said camera.

17. (Original) A rotatable-ring supporting structure of a lens barrel including:

a rotatable ring rotatable about a rotational axis extending in a direction of an optical axis, and configured to move at least one optical element along said optical axis thereof;

an annular ring which is non-rotatable and supports said rotatable ring inside said annular ring;

an advancing/retracting mechanism, provided between an outer peripheral surface of said rotatable ring and an inner peripheral surface of said annular ring , configured to move said rotatable ring along said optical axis between front and rear movement limits of said rotatable ring in said optical axis direction relative to said annular ring when said rotatable ring is rotated;

at least one circumferential groove located on said inner peripheral surface of said annular ring; and

at least one rotational projection located on said outer peripheral surface of said rotatable ring;

wherein said at least one rotational projection is engaged in said at least one circumferential groove such that said rotatable ring is rotatable at an axial fixed position without moving along said optical axis when said rotatable ring is moved to one of said front and rear movement limits by said advancing/retracting mechanism;

wherein said rotatable ring includes a pair of rotatable rings movable relative to each other in said optical axis direction and non-rotatable relative to each other;

wherein said at least one rotational projection is located on one of said pair of rotatable rings;

wherein the other of said pair of rotatable rings includes at least one engaging projection

located on an outer peripheral surface of said other of said pair of rotatable rings, and engaged in said circumferential groove, together with said rotational projection, when said rotational projection is engaged in said circumferential groove; and

wherein said rotatable-ring supporting structure includes at least one biasing arrangement configured to bias said pair of rotatable rings in opposite directions away from each other so that said at least one engaging projection and said at least one rotational projection are pressed against two opposed surfaces in said circumferential groove, respectively.

18. (Original) The rotatable-ring supporting structure according to claim 17, wherein said at least one rotational projection comprises a plurality of rotational projections located at different circumferential positions on said one of said pair of rotatable rings, and

wherein said at least one circumferential groove comprises a plurality of circumferential grooves located at different circumferential positions on said other of said pair of rotatable rings.

19. (Original) The rotatable-ring supporting structure according to claim 17, wherein said advancing/retracting mechanism comprises:

a male helicoid located on an outer peripheral surface of said rotatable ring; and

a female helicoid located on an inner peripheral surface of said annular ring , said female helicoid engageable with said male helicoid, said female helicoid and said male helicoid engaged with and disengaged from each other in accordance with variations in a relative position between said rotatable ring and said annular ring in said optical axis direction.

20. (Original) The rotatable-ring supporting structure according to claim 19, further comprising at least one non-threaded portion on said inner peripheral surface of said annular ring

in an area thereon in which and said female helicoid is located,

wherein said non-threaded portion extends generally parallel to threads of said female helicoid and communicates with said circumferential groove, and

wherein said rotational projection is configured to be associated with said at least one non-threaded portion when said male helicoid and said female helicoid are engaged with each other.

21. (Original) The rotatable-ring supporting structure according to claim 20, wherein an amount of projection of said at least one rotational projection in a radially outward direction is greater than a tooth depth of said male helicoid,

wherein said at least one non-threaded portion comprises at least one inclined groove extending generally parallel to said threads of said female helicoid, and

wherein said at least one rotational projection enters said at least one inclined groove when said male helicoid and said female helicoid are engaged with each other.

22. (Original) The rotatable-ring supporting structure according to claim 17, further comprising:

a linearly movable ring positioned inside said rotatable ring and configured to be guided linearly along said optical axis and move together with said rotatable ring along said optical axis; and

a coupling mechanism via which said pair of rotatable rings are coupled to said linearly movable ring respectively, and configured to be rotatable relative to said linearly movable ring and movable together with said linearly movable ring along said optical axis, said coupling

mechanism configured to allow each of said pair of rotatable rings to slightly move in said optical axis direction with respect to said linearly movable ring.

23. (Original) The rotatable-ring supporting structure according to claim 17, wherein said at least one engaging projection is accommodated in at least one recess located on said at least one rotational projection.

24. (Original) The rotatable-ring supporting structure according to claim 17, wherein said biasing arrangement comprises at least one compression coil spring positioned between two opposed end surfaces of said pair of rotatable rings.

25. (Original) The rotatable-ring supporting structure according to claim 17, wherein said at least one circumferential groove is elongated in a circumferential direction of said annular ring, and is configured to allow each of said at least one rotational projection and said at least one engaging projection to move in said at least one circumferential groove in said circumferential direction of said annular ring within a predetermined range of movement, and

wherein said optical element includes at least two optical elements which move along said optical axis while changing a distance therebetween and vary a focal length, when said rotatable ring rotates with both said at least one rotational projection and said at least one engaging projection engaged in said at least one circumferential groove.

26. (Original) The rotatable-ring supporting structure according to claim 17, wherein said lens barrel is incorporated in a camera, and

wherein said annular ring comprises a stationary barrel fixed to a camera body of said camera.

27. (Original) The rotatable-ring supporting structure according to claim 17, wherein said lens barrel comprises a telescoping lens barrel having a plurality of concentrically-arranged external movable barrels, said other of said pair of rotatable rings serving as one of said plurality of external movable barrels.

28. (Original) The rotatable-ring supporting structure according to claim 27, wherein said lens barrel is incorporated in a camera, and wherein said plurality of concentrically-arranged external movable barrels are retracted into a camera body of said camera upon power of said camera being turned OFF.

29. (Original) A rotatable-ring supporting structure of a lens barrel comprising a rotatable ring rotatable about a rotational axis extending in a direction of an optical axis, an annular ring which is non-rotatable and supports said rotatable ring inside said annular ring , and at least one optical element movable along said optical axis by a rotation of said rotatable ring,

wherein said rotatable ring includes a pair of rotatable rings movable relative to each other in said optical axis direction and not relatively rotatable;

wherein said rotatable ring includes a male helicoid formed on an outer peripheral surface of said rotatable ring;

wherein said annular ring includes a female helicoid which is formed on an inner peripheral surface of said annular ring to be engageable with said male helicoid, said female helicoid and said male helicoid engaged with and disengaged from each other in accordance with variations in relative position between said rotatable ring and said annular ring in said optical axis direction;

wherein said annular ring includes at least one circumferential groove formed on said inner peripheral surface of said annular ring at a position different from a position of said female helicoid in said optical axis direction; and

wherein one of said pair of rotatable rings includes at least one rotational projection formed on an outer peripheral surface of said one of said pair of rotatable rings at a position different from a position of said male helicoid in said optical axis direction to be slidably engageable in said at least one circumferential groove;

wherein the other of said pair of rotatable rings includes at least one engaging projection formed on an outer peripheral surface of said other of said pair of rotatable rings to be engaged in said at least one circumferential groove, together with said at least one rotational projection, in a state where said rotatable ring and said annular ring are positioned relative to each other in said optical axis direction such that said rotational projection is engaged in said circumferential groove; and

wherein said rotatable-ring supporting structure includes at least one biasing arrangement configured to bias said pair of rotatable rings in opposite directions away from each other so that said at least one engaging projection and said at least one rotational projection are pressed against two opposed surfaces in said circumferential groove, respectively.

30. (New) A digital camera comprising a body, a lens barrel housed within the body, and a supporting structure housed within the body and configured to support said lens barrel, said supporting structure comprising:

an annular ring having an axis and a circumferential engagement surface provided

circumferentially around said axis;

a first ring having an engagement surface circumferentially around said axis, and configured to contact said annular ring engagement surface and further configured to be mounted radially inwardly of said annular ring for rotational movement about said axis relative to the annular ring;

a second ring supporting at least one optical element, the second ring having an engagement surface provided circumferentially around said axis, and configured to contact the annular ring engagement surface and further configured to be mounted radially inwardly of said annular ring for rotational movement about said axis relative to the annular ring, the second ring being capable only of axial movement relative to the first ring; and

a biasing device configured to urge the first and second rings in generally opposite directions and bias the first and second ring engagement surfaces into contact with the annular ring engagement surface.

31. (New) The camera according to claim 30, wherein the annular ring engagement surface comprises one or more circumferential grooves located on an inner peripheral surface of said annular ring, and wherein the first and second ring engagement surfaces are pressed against the respective opposed surfaces of said one or more circumferential grooves.

32. (New) The camera according to claim 30, wherein said biasing device comprises at least one spring provided between the first and second rings.

33. (New) The camera according to claim 30, wherein said biasing device comprises at least one compression coil spring positioned between two opposed end surfaces of said first and

second rings.

34. (New) The camera according to claim 30, wherein the circumferential extent of the engaging surface of the second ring lies within the circumferential extent of the engaging surface of the first ring.

35. (New) The camera according to claim 30, wherein the engaging surface of the first ring comprises two or more radially extending projections formed at different circumferential positions.

36. (New) The camera according to claim 30, wherein the annular ring includes an additional engaging surface extending in the axial direction and configured to communicate with the circumferential engaging surface of the annular ring; and

wherein the first and second rings are movable together to a position where the engaging surface of the first ring contacts the additional engaging surface, the engaging surface of the second ring not contacting the additional engaging surface in said position.

37. (New) The camera according to claim 30, further comprising:

a linearly movable ring positioned radially inwardly of said first ring and configured to be guided linearly along said optical axis and move together with said first ring along said optical axis; and

a coupling mechanism configured to couple said first and second rings to said linearly movable ring, such that said first and second rings are rotatable relative to said linearly movable ring and are movable together with said linearly movable ring along said optical axis, said coupling mechanism configured such that each of said first and second rings are allowed by said

coupling mechanism to move slightly in said optical axis direction with respect to said linearly movable ring.

38. (New) The camera according to claim 30, wherein said annular ring comprises a stationary barrel fixed to said body.

STATEMENT OF SUBSTANCE OF INTERVIEW

Applicant wishes to express his appreciation to Examiner Smith for the interview of December 28, 2004. During the interview, Applicant's representative, Attorney William Boshnick, spoke to the Examiner concerning the rejected claims of the present invention. Specifically, Attorney Boshnick showed a model of an embodiment of the present claimed invention as well as a model similar to that disclosed in the applied NOMURA US 2001-0024573 Publication (in which the present inventor is a common inventor), and demonstrated how this reference failed to teach or suggest the invention as claimed in rejected claims 1, 3, 4, 6 and 14-16. The Examiner agreed that the prior art of record fails to teach or suggest at least the feature wherein the second ring contacts the annular ring engagement surface and further wherein a biasing arrangement configured to urge the first and second rings in generally opposite directions and bias the first and second ring engagement surfaces into contact with the annular ring engagement surface, as claimed in independent claim 1. However, the Examiner indicated that he would conduct an updated search before making a final decision on allowance.